Changes in numbers of Lesser Kestrels *Falco naumanni* and Amur Falcons *F. amurensis* at a winter roost in Lesotho

Grzegorz Kopij

Changements des effectifs du Faucon crécerellette *Falco naumanni* et du Faucon de l'Amour *F. amurensis* dans un dortoir hivernal au Lesotho. Pendant les 20 dernières années des changements importants ont été enregistrés dans la composition d'un groupe de Faucons crécerellettes *Falco naumanni* et de Faucons de l'Amour *F. amurensis* dans un dortoir sur le campus de l'Université nationale de Lesotho à Roma. Les effectifs du Faucon de l'Amour ont augmenté, tandis que ceux du Faucon crécerellette ont chuté de façon impressionnante. Les changements dans le nombre de Faucons de l'Amour enregistrés en février–mars semblent indiquer que leur migration vers le sud continue jusque début février, et que peu après le départ vers le nord débute, la majorité des oiseaux quittant le dortoir pendant la première moitié de mars. La première arrivée du Faucon crécerellette a été notée le 26 octobre, le dernier départ le 9 avril. L'arrivée la plus précoce du Faucon de l'Amour a eu lieu le 19 décembre, le dernier départ le 7 avril. Le départ du dortoir le matin prenait jusqu'à 40 minutes, la majorité des oiseaux quittant toutefois pendant les premières 5–10 minutes.

Summary. Over the last 20 years drastic changes have been recorded in the composition of a flock of Lesser Kestrels *Falco naumanni* and Amur Falcons *F. amurensis* at a roost on the campus of the National University of Lesotho at Roma. Numbers of the latter have increased, while those of the former species have dramatically decreased. Changes in the number of Amur Falcons recorded in February–March suggest that their southward migration continues until early February and soon thereafter a departure north starts, with most birds vacating the roost in the first half of March. The earliest arrival of Lesser Kestrel was 26 October, the latest departure 9 April. The earliest arrival date of Amur Falcon was 19 December, the latest departure date 7 April. Early-morning departure from the roost lasted for up to 40 minutes, but most birds left during the first 5–10 minutes.

Lesser Kestrel *Falco naumanni* and Amur Falcon *F. amurensis* are common Palearctic migrants in southern Africa (Hockey *et al.* 2005). Both species take advantage of favourable feeding conditions in this region, where they prey mainly on locusts, dung beetles, alate termites and sun spiders (Kopij 1998, 2002, 2004, 2006, 2010). Amur Falcon breeds in north-east Asia and arrives in southern Africa in late November / early December, frequenting mainly the eastern part of the region, and departs in March. Lesser Kestrel breeds in the southern Palearctic. It arrives in southern Africa in October / November, occurring commonly in the Highveld and neighbouring areas, and departs in March / April (Hockey *et al.* 2005). On their wintering grounds both species roost commonly in large trees, usually on the outskirts of towns (Hockey *et al.* 2005). These roosts are often occupied in consecutive years. Temporal and spatial changes in numbers at roost sites occur (Colahan 1992, Nuttall 1992, 1993) and have been quantified in detail at Vrede, Free State (Warden *et al.* 2008).

Because of the difficulties of reliably estimating numbers of wintering falcons, which fluctuate markedly on a daily and seasonal basis (Colahan 1992, Nuttall 1992, 1993, Warden *et al.* 2008), it has been recommended to repeat counts up to 50 times to precisely estimate the size of a flock and to establish trends (Warden *et al.* 2008). This is, of course, an unrealistic recommendation, even if researchers are resident near roost sites. Large-scale monitoring, as conducted by Colahan (1992) and Nuttall (1992, 1993), would prove impossible if each roost had to be counted at least 50 times. Moreover, such a meticulous count at a single roost site will not necessarily establish clear population trends, as numbers may fluctuate in response to local weather conditions. However, in places where relatively stable rainy conditions (and food availability) prevail, long-term counts may reveal real trends in numbers and changes in the structure of a wintering flock.

Here I present the results of quantified studies on temporal changes in a mixed flock of Lesser Kestrels and Amur Falcons roosting at a

traditional site in Lesotho under relatively stable rainy conditions.

Roost site

Observations were made on the campus of the National University of Lesotho (NUL) at Roma. The NUL campus is in a valley surrounded by high sandstone cliffs at the base of the Maloti / Drakensberg Mountains (29°32'–29°26'S 28°42'–28°48'E), at 1,500–2,000 m. The Roma Valley is basically a rural area with just one major settlement and *c.*30 villages in the environs surrounded by cultivated fields. Maize is the dominant crop, whilst sorghum and beans are cultivated to lesser extent. Plateaux south of the Roma Valley are mainly grass-covered and used as pasture for sheep, goats and cattle (Kopij 2001). Roma is well timbered with exotic trees such as *Eucalyptus* spp., *Pinus* spp., *Chamaecyparis* spp., *Cupressus* spp., *Cedrus atlantica*, *Populus deltoids*, *P. canescens*, *P. nigra* '*italica*', *Salix babylonica*, *Quercus* spp., *Acacia* spp. and many others (Kopij 2001, 2006b, Talukdar & Ambrose 2003).

Falcons winter in Lesotho during the wet season, i.e. October–March, when mean precipitation accounts for 77% of the total annual rainfall (Kopij 2001). Rainfall at Roma during the main study period, i.e. the wet season of 1999 / 2000, was much higher (1,010 mm) than the long-term average (670 mm), while the wet season of 2000 / 01 was very close to the long-tem average (Kopij 2001). The amount of rainfall in the wet season at Roma never fell below 400 mm during a recent 40-year period (1961–2001) and in almost 50% of these years was greater than 700 mm (Kopij 2001). These figures contrast with lower and much more erratic precipitation in most of the Highveld in South Africa.

The roost site on the NUL campus is a tall (32 m) and old (*c.*130 years) *Eucalyptus camaldulensis*. It is the tallest tree in the entire Roma Valley. The tree is close to student residences and to other *Eucalyptus* and cedars *Cedrus atlantica*.

Methods

Dates of the first arrival and last departure of Lesser Kestrels and Amur Falcons at the Roma roost were determined for each winter season during 1995–2002 by daily checking their presence.

Data on the maximal flock size of roosting falcons during five winter seasons in 1982–98 were taken from the literature (Ambrose & Maphisa 1999, Bonde 1993, Kopij 2001a) while those for 1999–2002 were obtained by direct counts made by the author. Counts in 1978–98 and 1999–2002 were conducted at the start of each month when birds were present at the roost site. Seasonal maxima simply represent the largest single count during a given winter. During the 2001 / 02 season observations commenced on 1 January 2002, when the first birds arrived, and were discontinued after 15 January 2002.

All counts in 1999–2002 were made from *c.*05.00 hrs, i.e. before sunrise, until all birds had departed the roost. Each count was subdivided into ten-minute-units and the birds were counted afresh during each time unit.

To elucidate how the number of roosting kestrels changed over the course of a winter, counts were conducted each fortnight during one austral summer (2000 / 01) from 15 December 2000, when the falcons had just arrived, to 1 April 2001, when all had departed.

To uncover a pattern of departure of falcons to their Palearctic breeding ranges, from 9 March to 8 April 1998 (the end of the wintering period), regular counts were conducted every 3–6 days in the evening, when birds were arriving at the roost.

To establish a pattern of early-morning departure in relation to season (date of sunrise / sunset), falcons were counted on 3 and 15 February, 1 March 2001, and 16 February 2002. Each count commenced at 04.30 hrs when all of the birds were still roosting, and ended at *c.*06.00 hrs, when all had departed for hunting. On each morning the birds were counted from a distance of *c.*100 m in an exposed site from where all of the departing birds could easily be observed. Observations were made using 10×50 binoculars.

In the darkness of the early mornings and evenings it was sometimes difficult to distinguish between the two species. In the 2001 / 2002 season this problem was probably virtually non-existent, as the wintering flock was apparently composed entirely of Amur Falcons. Similarly, few problems with identification existed prior to 1988, when in contrast the roosting flock probably almost entirely comprised Lesser Kestrels. In other years, however, the flock was clearly mixed, and some misidentifications may have occurred, although attempts were made to identify each individual. Male Amur Falcons were

easily distinguished from male Lesser Kestrels by their pale underwing-coverts and by the generally much darker coloration of the upperparts. Female or juvenile Amur Kestrels were distinguished from female or juvenile Lesser Kestrels by their much darker heads.

Results

The Lesser Kestrels adopted the NUL campus as a roost site on 11 February 1982. Six days later, the size of the flock was estimated at 300–500 birds. Most left the campus between 27 and 29 March 1982, and only nine remained until 2 April 1982. A similar pattern for departure occurred in subsequent years. On 24 January 1998 the roosting flock was estimated at 522 individuals (Ambrose & Maphisa 1999).

Amur Falcons made their first appearance in the Lesser Kestrel roost on 16 February 1988. Subsequently, numbers gradually increased to at least 40 in 1993 / 94 and *c.*70 in 1996 / 97 (Ambrose & Maphisa 1999). In 1997 / 98, the max. number of Amur Falcons was 322 (on 9 March) (Ambrose & Maphisa 1999).

Over the next few years, major changes were observed in the composition of the roosting flock (Fig. 1). Whereas in 1994 no more than 40 Amur Falcons were recorded, 75 were counted on 12 January 1997 and 322 on 9 March 1998 (Ambrose & Maphisa 1999). The largest flock in 2000 / 01 comprised 926 individuals, on 15 February 2001. No systematically collected data on numbers of roosting Amur Falcons are available for the following austral summer, but on 16 January 2002, there were 282 individuals.

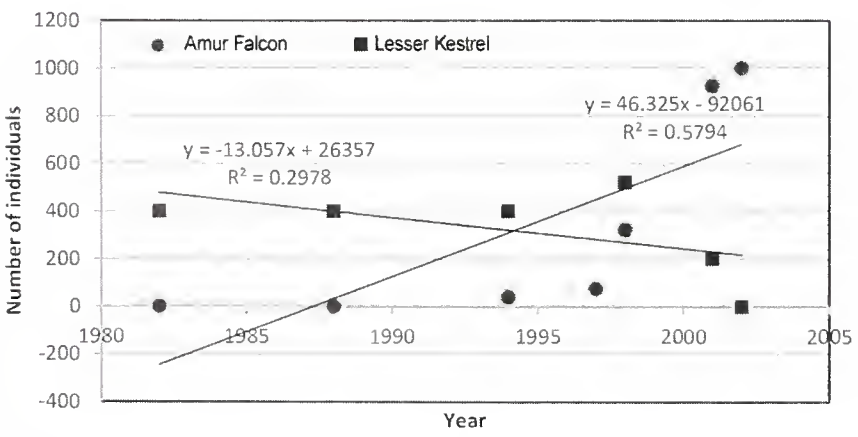

Figure 1. Annual changes in the number of Lesser Kestrels *Falco naumanni* and Amur Falcons *F. amurensis* at the Roma roost , Lesotho, during 1982–2002.

Changements annuels des effectifs du Faucon crécerellette *Falco naumanni* et du Faucon de l'Amour *F. amurensis* sur le dortoir de Roma, Lesotho, en 1982–2002.

One year earlier at the same time, only *c.*50 Amur Falcons were present in the roost. On the other hand, the numbers of Lesser Kestrels present at the roost declined dramatically over the same period. On 24 January 1998, 522 were counted, and it appears that between 1982 and 1998 there were always 300–500 birds in the roost (Ambrose & Maphisa 1999). However, no more than 200 roosted on the NUL campus in 2000 / 01 (Kopij 2001a), and by 20 January 2002, none was present (Fig. 1).

Changes in the number of roosting Amur Falcons recorded in January–March 2001 suggest that their southbound migration continues until early February and soon thereafter a gradual departure north starts, with most birds vacating the roost site in the first half of March (Figs. 3–4). The departure of the remaining birds may, however, continue for another 20–30 days (Fig. 3). In 2001 / 02, the first three birds did not appear on the campus until as late as 1 January 2002, but one week later *c.*50 were present and on 16 January 282 birds were counted.

The earliest arrival of Lesser Kestrels on the NUL campus was 26 October 1995; the latest departure 9 April 1998 (Table 1). The earliest arrival for Amur Falcon was 19 December 2001 (GK), the latest date 7 April 1998 (D. Maphisa). In 1999 / 2000, all Lesser Kestrels departed unusually early, on 10 February (Kopij 2001).

Both Amur Falcons and Lesser Kestrels roosted on the campus by night, with only a few during the day. Generally, they returned half an hour before to an hour after sunset. However, on a few occasions almost annually, falcons returned to the roosting site later than usual. On such occasions they were seen preying on emerging alate termites. Such events happened once or twice p.a. on wet

Table 1. Earliest and latest dates for Lesser Kestrels *Falco naumanni* at Roma, Lesotho, in 1995–2002.

Tableau 1. Premières et dernières dates pour le Faucon crécerellette *Falco naumanni* à Roma, Lesotho, en 1995–2002.

Earliest arrival date	Latest departure date	Observer
27.10.1995	04.03.1996	D. Maphisa
26.10.1997	09.04.1998	D. Ambrose
05.11.1998	?	D. Ambrose
11.11.1999	10.02.2000	G. Kopij
31.12.2000	25.03.2001	G. Kopij
01.01.2002	?	G. Kopij

days, usually in November and March. Following such evening hunting, falcons did not disperse normally from the roost site next morning. Most remained in the tree throughout the following day, merely loafing, except for some comfort movements (e.g. preening).

Early-morning exodus lasted up to >40 minutes (Table 2). Most birds, however, departed during the first 5–10 minutes (Fig. 2). On 15 February 2001, a flock of 926 Amur Falcons started leaving the roost at 05.23 hrs (i.e. 28 minutes before sunrise) during the same period that three dove species (the commonest breeding birds on the campus, Kopij 2001): Cape Turtle *Streptopelia capicola* (05.19 hrs), Red-eyed *S. semitorquata* (05.20 hrs) and Laughing Dove (05.29 hrs) *S. senegalensis*, were starting to sing. Most falcons departed after 20–40 minutes and the last birds left at 06.03 hrs. However, a smaller

Table 2. Departure times from the Roma roost in relation to sunrise and Lesser Kestrel *Falco naumanni* and Amur Falcon *F. amurensis* flock size in the 2000 / 2001 austral summer.

Tableau 2. Heures de départ du dortoir à Roma par rapport au lever du soleil et la taille des groupes du Faucon crécerellette *Falco naumanni* et du Faucon de l'Amour *F. amurensis* pendant l'eté austral de 2000 / 2001.

Date	Time of departure		Sunrise*	Flock size	Duration of departure
	start at	end at			
16 January	04.52	05.07	05.26	282	15 minutes
3 February	05.06	05.51	05.42	847	45 minutes
15 February	05.23	06.06	05.51	926	43 minutes
1 March	05.23	05.56	06.02	535	33 minutes
20 March	05.56	06.12	06.14	195	16 minutes
Mean	05.20	06.50	05.51	557	30 minutes

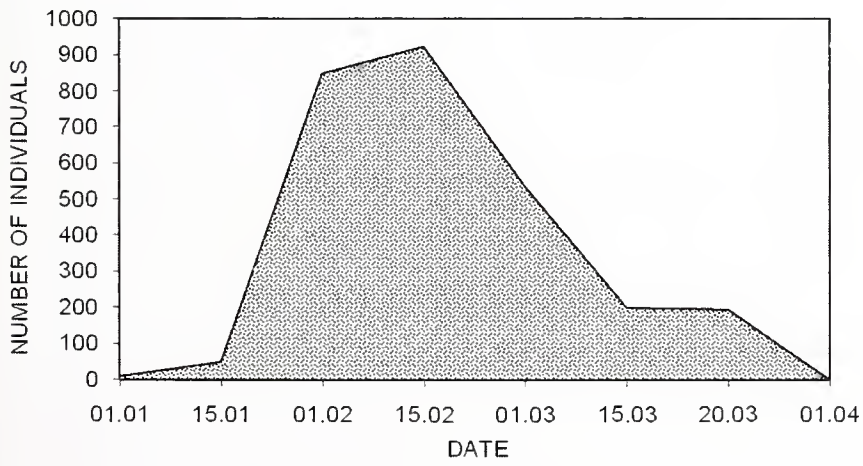

Figure 2. Seasonal changes in the number of the Amur Falcons *Falco amurensis* at the end of the 2000 / 2001 austral summer at the Roma roost, Lesotho

Changements saisonniers des effectifs du Faucon de l'Amour *Falco amurensis* à la fin de l'été austral 2000 / 2001 dans le dortoir de Roma, Lesotho

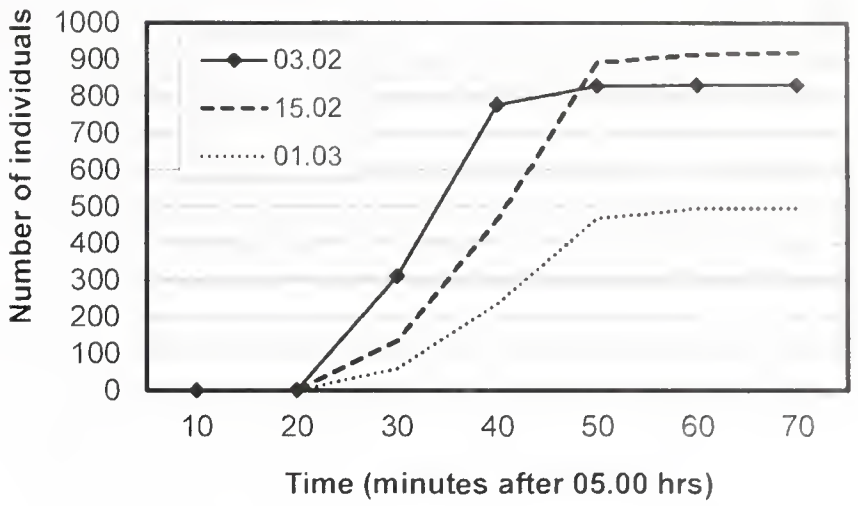

Figure 3. Patterns of morning departures of Amur Falcon *Falco amurensis* from the Roma roost, Lesotho, with the advancing of the 2000 / 2001 wintering season (birds were counted in ten-minute units; see text).

Pattern des départs matinaux du Faucon de l'Amour *Falco amurensis* du dortoir de Roma, Lesotho, pendant l'hivernage de 2000 / 2001 (les oiseaux ont été comptés par unité de dix minutes ; voir le texte).

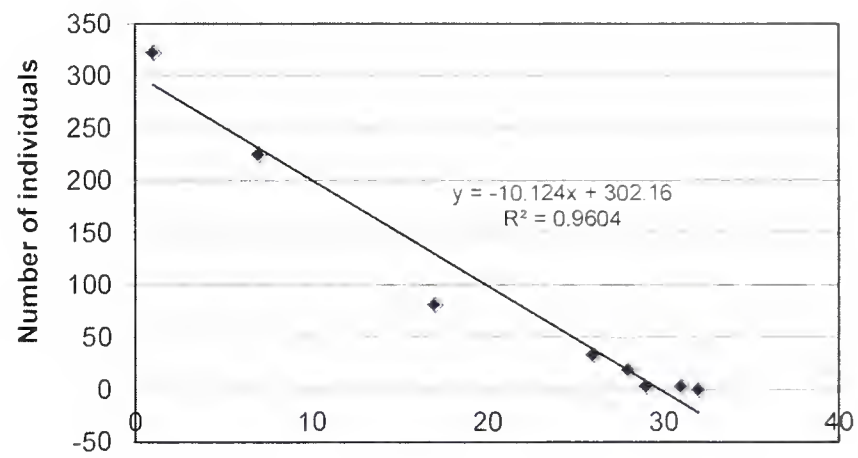

Figure 4. Patterns of morning departures of Amur Falcons *Falco amurensis* from the Roma roost , Lesotho, with the advancing of the wintering season.

Pattern des départs matinaux du Faucon de l'Amour *Falco amurensis* du dortoir de Roma, Lesotho, pendant la saison d'hivernage.

flock of 282 birds left the roost between 04.52 and 05.07 hrs (Fig. 2). On average, birds started to leave 31 minutes before sunrise (SD = 8.31; *N*=5), but this may range from 18 to 39 minutes.

Discussion

Eucalyptus trees in towns and villages are the principal roost sites for Amur Falcons and Lesser Kestrels in southern Africa (Nuttall 1992, 1993, Hockey *et al.* 2005), where the two species occasionally share roosts (Steyn 1982, Maclean 1993). In Free State, in addition to the main Lesser Kestrel flock, other small falcons, such as Amur and Red-footed Falcons *Falco vespertinus*, have been recorded in a few of 110 known roosts,

always in small numbers (Colahan 1992, Nuttall 1992, 1993). These latter species are commoner further north in southern Africa (Hockey *et al.* 2005). Probably most roosts in Lesotho previously occupied exclusively by Lesser Kestrels are now shared with Amur Falcons (pers. obs.).

Roost sites of Lesser Kestrels and Amur Falcons can often be regarded as 'traditional' (Hockey *et al.* 2005). The Roma site has been occupied by Lesser Kestrels for 20 years, and by Amur Falcons for 14 years (this study). A roost in *Eucalyptus* trees in Maseru near the King's Palace and the Anglican Cathedral has been used by Lesser Kestrels since 1973 (I. de la Rosa) and by Amur Falcons since 1980 (Bonde 1993, Kopij 2000). A roost at Senekal, in neighbouring South Africa, has been used by Lesser Kestrels since 1956 (Kolbe 1972) until the present (B. Barnes pers. comm.). There is also a large *Eucalyptus* in the centre of Bloemfontein that has been used by Lesser Kestrels since *c.*1950 (Kopij 2001b) until the present (D. de Swardt). A roost 25 km west of Dedza, Malawi, was occupied by several thousand Amur Falcons for at least ten years (Benson 1951).

Kolbe (1972) gives extreme arrival dates of Lesser Kestrels at Senekal, eastern Free State, as 23 October 1969, 24 October 1970 and 26 October 1971, and extreme departure dates as 29 March 1970 and 3 April 1971. Warden *et al.* (2008) give extreme dates for Lesser Kestrels at Vrede, Free State, as 24 October and 9 April. Benson (1951) gives 12 December and 7 March as extreme dates for Amur Falcons roosting near Dedza, Malawi. One could reach the false conclusion that the duration of the wintering season of Lesser Kestrel is uniform across southern Africa. However, at least in the Highveld it appears to become shorter southwards, e.g. at Vrede the mean time is 139 days (n=5) (Warden *et al.* 2008), compared to 117 days at Roma (this study).

It appears that during 1995–2001 not only were there substantial changes in the wintering flocks of Lesser Kestrel, but that a substantial shift in arrival dates at the Roma roost occurred. Over the last six winters, they gradually started to arrive up to 63 days earlier (Table 1). During 1993–97 Warden *et al.* (2008) recorded a similar pattern of seasonal changes in the number of roosting kestrels. Numbers increased from late October to late December, remained relatively stable in January–February and sharply decreased in March, while the site was vacated in early April. However, no shifts between years were recorded. Data both from Free State (Warden *et al.* 2008) and Roma (this study) reveal that the best time to count falcons at their roosts is January–February, when numbers are relatively stable. Therefore, any large-scale surveys of sites should be undertaken at this time of the year, preferably in the second half of January and first half of February.

Benson (1951) observed that almost all Amur Falcons leave their roost within ten minutes, almost immediately after dawn and return shortly before sunset, circling for *c.*0.5–1.0 hours before settling. My observations suggest that the time during which falcons leave their roost varies from 15 to 50 minutes (χ = 30 minutes), depending on the size of the roost, periods being shorter if the flock is small. The time of departure from and return to the roost varies depending on the time of sunrise and sunset respectively. Birds left their roost as early as 05.00 hrs at the start of February and as late as 06.00 hrs at the end of March. If the sky is overcast, however, the falcons may leave the roost 2–3 hours later than in sunny conditions.

Lesser Kestrel roosting flocks are unstable, changing continually in size and composition both within and between seasons, and numbers seem to depend on prevailing rainy conditions (Nuttall 1993, Warden *et al.* 2008). Warden *et al.* (2008) proved that three counts, a system commonly applied to count roosting kestrels, are likely to be unreliable to estimate population size and trends in *F. naumanni*. The max. size of the falcon roost at Roma might be therefore underestimated, especially prior to 1998.

Causes of the changes in numbers and composition of the roosting flock at Roma are unclear. It is also unknown if similar changes took place at other roosts in Lesotho. Such changes may have occurred locally, and be caused by human disturbance. On 22 February 1998, NUL hosted the Inter-Varsity Games, accompanied for seven days by very loud music at night, broadcast from a house <100 m from the roost. The falcons decamped to a similar tree 820 m away (Ambrose & Maphisa 1999). Similar disturbance continued during subsequent years. It is, however, interesting to note that only Lesser Kestrels abandoned this site, while Amur Falcons remained. Perhaps Amur Falcons are less susceptible to human disturbance than Lesser Kestrels.

It is also plausible that the changes that occurred at the Roma roost could have been induced by unfavourable weather conditions (much-reduced rainfall) for Amur Kestrel in its main wintering grounds in the former Transvaal (Hockey *et al.* 2005). The reverse may be true for Lesser Kestrel. Warden *et al.* (2008) noted an increase in the size of the wintering Lesser Kestrel flock at Vrede, Free State, during 1993–97 and no changes in the structure of the flock.

The substantial changes recorded at the Roma roost could, however, also reflect the general situation of these species in their breeding ranges. In Europe, Lesser Kestrel has dramatically declined over the last few decades, although most recently numbers have stabilised (www.birdlife.org/datazone/speciesfactsheet.php?id=3589). Population trends in Amur Falcon are apparently unknown (Ferguson-Lees & Christie 2001), but it is possible that the species is increasing.

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Department of Vertebrate Ecology, Wroclaw University of Environmental & Life Sciences, Kozuchowska 5b, 51-351 Wroclaw, Poland.

**Present address: Department of Integrated Environmetal Science, University of Namibia, Ogongo Campus, Private Bag 5520, Oshakati, Namibia. E-mail: gkopij@unam.na*

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